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ABSTRACT

Anxiety about statistics can result in impaired performance, mental anguish, and avoidance of statistics courses needed for professional advancement. In this study, 53 graduate students enrolled in an introductory course in educational research were administered the Statistical Anxiety Rating Scale (STARS) (A. Onwuegbuzie, 1998). During the 7 weeks of the course, the instructor employed strategies noted in the literature as possibly helpful in alleviating anxiety in statistics classes: addressing the anxiety, using humor, applying statistics to real-world situations, reducing fear of evaluation, and encouraging students to work in cooperative groups. STARS was administered as a posttest at the final course session. A paired-samples t-test was used to compare the means of the pretest and posttest scores. Differences in the total score and five of six factors (worth of statistics, interpretation anxiety, test and class anxiety, fear of asking for help, and fear of the statistics teacher) were significant at the 0.001 level. Difference in one factor (computation self-concept) was significant at the 0.01 level. All mean scores were reduced, denoting a reduction in anxiety from the pretest to the posttest. It appears it is possible to reduce statistics anxiety in graduate education students by using specific instructional strategies. (Contains 2 tables and 19 references.) (Author/SLD)

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Running Head: REDUCING STATISTICS ANXIETY

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A Study of Reduction of Anxiety in Graduate Students in an Introductory Educational Research Course

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Abstract

Anxiety about statistics can result in impaired performance, mental anguish, and avoidance of statistics courses needed for professional advancement. In this study, 53 graduate students enrolled in an introductory course in educational research were administered the Statistical Anxiety Rating Scale (STARS). During the seven weeks of the course, the instructor employed strategies noted in the literature as possibly helpful in alleviating anxiety in statistics classes: addressing the anxiety, using humor, applying statistics to real-world situations, reducing fear of evaluation, and encouraging students to work in cooperative groups.

STARS was administered as a post test at the final course session. A paired-samples *t*-test was used to compare the means of the pretest and posttest scores. Differences in the total score and five of six factors (worth of statistics, interpretation anxiety, test and class anxiety, fear of asking for help, and fear of the statistics teacher) were significant at the .001 level. Difference in one factor (computation self-concept) was significant at the .01 level. All mean scores were reduced, denoting a reduction in anxiety, from the pretest to the posttest.

It appears that it is possible to reduce statistics anxiety in graduate education students by employing specific instructional strategies.

A STUDY OF REDUCTION OF ANXIETY IN GRADUATE STUDENTS IN AN INTRODUCTORY EDUCATIONAL RESEARCH COURSE

Mathematics anxiety, the "panic, helplessness, paralysis, and mental disorganization that arises among some people when they are required to solve a mathematics problem" (Hunt, 1985, p. 32), generalizes to statistics anxiety in the educational research classroom. With its milder forms, students experience emotional discomfort and performance impairment; in more extreme cases, students may avoid career-advancing graduate courses, including educational research, that require statistics (Richardson & Suinn, 1972).

Although there has not been a great deal of quantitative research on how teaching strategies affect anxiety in the educational research classroom, many researchers have suggested ways to alleviate anxiety. Among these strategies are the following: addressing the anxiety (Tobias, 1978 and 1991; Dillon, 1982; Hunt, 1985; Yager & Wilson, 1986), using humor (Smith, Anscough, Ettinger, & Nelson, 1971; Kosbab, 1989; Schacht & Stuart, 1990), applying statistics to real world situations (Yager & Wilson, 1986; Schacht & Stewart, 1992; Thompson, 1992; Stallings, 1993), reducing fear of evaluation (Hunt, 1985; Johnson, 1988; Kosbab, 1989), and encouraging students to work in small cooperative groups (Burton, 1984; Blum-Anderson, 1992; Mealey & Host, 1992).

The intention of this study was to determine if employing the strategies noted in the literature as helpful in alleviating anxiety in statistics classes would, in fact, reduce measures of anxiety in graduate students taking an educational research course, part of which involved using statistics as a research tool.

Methodology

Participants

The participants in this study were 53 students enrolled in EDUC 514: Educational Research Methods, one of the core courses in Muskingum College's Master of Arts in Education program during Fall Term 1997. Included were 6 males and 47 females, with a mean age of 35.3. Thirty-five of the students attended class on the main campus; 18 attended class in a satellite location forty miles from the main campus. All but one were employed in teaching in elementary and secondary schools in southeastern Ohio. Fifty-two are Caucasian; one is African American. Mathematics experience in the group varied from having no college mathematics other than math for elementary teachers to having already taken a statistics course at the graduate level. The average participant had taken math for elementary teachers and one other mathematics course, usually college algebra.

Procedures

At the beginning of the first class, students were given the Statistical Anxiety Rating Scale (STARS), which measures six factors of statistics anxiety: worth of statistics, interpretation anxiety, test and class anxiety, computation self-concept, fear of asking for help, and fear of the statistics teacher (Cruise & Wilkins, 1980). Participation was voluntary and anonymous. (For a detailed description of STARS, see Onwuegbuzie, 1998.)

During the seven weeks of the course, the instructor followed a systematic program of using the teaching strategies purported in the literature to reduce anxiety. To address the issue of anxiety, the instructor prefaced new material with phrases such as "I know this is new, and some of you will be uncomfortable with it for a while" and "Don't freak out on me, but there's a little

more we need to tack on here." Three times during the course, students were asked to reflect for a minute on how they were feeling about taking educational research and then to share their thoughts with the class. Thus, students were encouraged to acknowledge that their feelings of anxiety were not unexpected--and that many of their colleagues shared those same feelings.

At least three "humorous moments" were interjected into each class period, ranging from showing statistics-related cartoons on the overhead projector to telling jokes and personal anecdotes. As the course progressed, the humor became less mathematics-oriented as the instructor learned that it took very broad humor to get all students to set aside their anxiety for even a moment.

Statistics was applied to real world situations in both teacher-directed instruction and student projects. Rather than use published data sets as instructional examples, data was collected from students, from simulated research, and from the instructor's own research. Each student produced a research proposal and paper based on data collected from his or her own classroom or school, centered on an issue of personal interest or concern.

There were no formal tests in the course. Students were assessed on analysis of data sets which required the use of statistical software, critiques of journal articles, and the research proposal and paper. Students who were not satisfied with their performance on the initial assessments were permitted to redo assignments to improve their grades.

Students were required to work in cooperative groups for in-class assignments. They were encouraged to work together on analyzing the data sets. In addition, groups of three students with common interests served as "support groups" for each other in completing the research proposals and papers.

On the final class date, STARS was once again administered. A paired-samples *t*-test was used to compare the means of the pretest and posttest scores for each of the six factors and for the total score.

Results

When compared with normed scores of 229 graduate students (Cruise, Cash, & Bolton, 1985), mean anxiety scores of students in this study were markedly higher on each factor of the initial administration of STARS; mean anxiety scores for the posttest were lower for each of the factors and at or near the means of the normed scores for three of the six factors. Percentile ranks for each factor for both the pretest and posttest are displayed in Table 1.

Table 1

Percentile Ranks of Mean Scores on Factors of STARS for the Pretest and Posttest (N=53)

Factor	Pretest Percentile Rank*	Posttest Percentile Rank*
Worth of Statistics	90	70
Interpretation Anxiety	86	68
Test and Class Anxiety	70	51
Computation Self-Concept	60	50
Fear of Asking for Help	82	66
Fear of Statistics Teacher	62	45

*Percentile ranks were extrapolated from tables provided by Cruise, Cash, & Bolton (1985).

Table 2 shows the results of paired-sample *t*-tests of differences of means for the total score and for the scores of the six factors. Differences between mean scores for the total score and five of the six factors--worth of statistics, interpretation anxiety, test and class anxiety, fear of asking for help, and fear of the statistics teacher--were significant at the .001 level. The difference between mean scores for one factor--computation self-concept--was significant at the .01 level. All mean scores were reduced from the pretest to the posttest, denoting a reduction in anxiety.

Table 2

Means of Pretest and Posttest Scores (N=53)

	df	Pretest	Posttest	*t*
Total Score	47	144.45	119.44	6.54**
Worth of Statistics	48	44.02	35.00	6.21**
Interpretation Anxiety	47	34.34	28.50	4.60**
Test and Class Anxiety	48	28.28	23.86	4.70**
Computation Self-Concept	48	16.15	14.10	3.30*
Fear of Asking for Help	48	9.98	7.61	4.48**
Fear of Statistics Teacher	48	11.68	9.80	4.16**

Note. *p<.01. **p <.001.

Discussion

It appears that it *is* possible to reduce the anxiety of graduate students in educational research courses. This statement should be of interest to faculty members who find that their students are as excited about attending their classes as they would be about visiting the dentist one evening a week for 16 weeks--and who have no nitrous oxide to offer to lessen the pain!

Beyond the simple statement that statistics anxiety can be reduced, there is little that this study can offer in the way of specific recommendations. The lack of a control group and the great number of variables precludes a statement as to exactly *what* reduced the high anxiety levels experienced by the educational research students in this study.

Always a concern in research studies of student affect, including anxiety, is the question of student learning. Have we dished up a "feel good" course at the expense of academic achievement? As a beginning teacher of educational research, my challenge in this study was to reduce anxiety while maintaining or even raising the level of achievement. Again, with no basis for comparison but anecdotal comments from colleagues about the improved preparedness of this crop of students for beginning their research theses--due largely, I presume, to the small research projects they completed--we can draw no conclusions about any tradeoffs between anxiety reduction and achievement.

So, at least two important questions remain: 1) Exactly *what* can be done to reduce anxiety in the educational research classroom? and 2) Can we reduce anxiety while simultaneously maintaining--or even raising--student achievement? Further research, including qualitative studies and quantitative studies in controlled environments, will be necessary to explore these questions further.

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